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Two-Layer Fuzzy Comprehensive RSA-ANP-DSS Evaluation Model of Emergency Management Capacity about Enterprise Value Network

Bu Huabai[a,b]*,Bu Shizhen[a]

[a]*Hengyang Normal University, Hengyang, Hunan 421008,China*
[b]*School of Business, Central South University, Changsha, Hunan, 410083,China*

Abstract

The enterprise value network engineering is an effective social business carrier, but the "sudden adversity" or "sudden disaster" often occurs to every internal enterprise in the value network engineering system or outside, which makes the enterprise have to have a good emergency management ability in order to avoid the final crisis. The article uses a system analysis approach to construct a two-layer fuzzy comprehensive evaluation model of emergency management capacity about enterprise value network engineering based on RSA-ANP-DSS research methods, which can provide a decision-making theory foundation for emergency management and improve emergency management capabilities to the "sudden adversity" or "sudden disaster" in the value network engineering.

Keywords: value network engineering; emergency management capability; evaluation model; RSA-ANP-DSS method

1. Introduction

Emergency management issues are growing concern in the entire world since "9.11" terrorist attacks in the United States, but so far, "emergency management" is not a unified concept, George D. Haddow and Jane A. Bullock[1] considered that Emergency Management is a science processing to avoid the risk, including pre-disaster preparedness, disaster response, support and social reconstruction after the occurrence of natural or man-made disasters. Lei Ji etal[2] considered that emergency management is a process of emergency in order to reduce incidents of harm and optimize decision-making, analyze the reasons for unexpected events, processes and consequences, effectively integrate all social aspects related resources for effective early warning of emergencies, control and treatment. Currently, the object of emergency management capacity assessment is the disaster emergency management system[3] ,it is defined as a comprehensive emergency management to construct evaluation indicators system by scientific method and an assessment model and then do a comprehensive assessment in order to find the problem and lack, then do continuous refinement and improvement. The concept of value network[4] was firstly proposed in 2001 by David. Value Network Engineering theory considered enterprise Value Network Engineering

* Corresponding author: Bu Huabai Tel.:13974790273; fax: 0734-8484913
E-mail:buhuabai@163.com.

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system is made of “vendor system”, the “Company”, “customer system”, “replacement system”, “complements those systems”, each subsystem has its inherent vulnerability, and they are affected by their different fragile factors. The enterprise Value Network Engineering as a purpose engineering system is a social cost-effective business carrier, but every enterprise in in-house Value Network Engineering or outside, often occur “sudden adversity” or “sudden disaster”, and then they stimulated local enterprise vulnerability [5], which makes the enterprise have to a good emergency management ability in order to avoid final crisis in the enterprises, such as the U.S. Leiman Brothers, the Chinese Sanlu milk powder, and so on. The article uses a systems analysis approach to construct a two-layer fuzzy comprehensive evaluation model of enterprise Value Network Engineering emergency management capacity based on RSA-ANP-DSS research methods, which can provide a decision-making theory foundation for emergency management and improve emergency management capabilities.

2. Assessment model

2.1 Determining the weight based on RSA-ANP-SSD method

RSA-ANP-SSD is a method combining subjective and objective weight, its basic idea is: determining the objective indicators and subjective weights according to the Method of RSA and ANP, respectively, and then using minimum variance as the objective function to combine subjective with objective weight.

RSA（Rough Set Analysis）method.

Supposing $s = (U, A, V, f)$ is an information system by collecting a large number of the historical average samples, $P \subseteq A, U / IND(P) = \{x_1, x_2, ..., x_n\}$, p is defined as the amount of information:

$$I(P) = \sum_{i=1}^{n} \frac{|Xi|}{|U|}\left[1 - \frac{|Xi|}{|U|}\right] = 1 - \frac{1}{|U|^2}\sum_{i=1}^{n}|Xi|^2$$

Where $|X|$ is set the base; $\frac{|X_i|}{|U|}$ is equivalence class Xi probability in U., the importance of Index $c \in C$ in indicators is as follows:

$$Sig_{C-\{c\}}(c) = I(C) - I(C - \{c\})$$

Therefore, the importance of Index $c \in C$, $C = \{c_1, c_2, ..., c_n\}$, in indicators can be measured by removing c from C after the change in size due to the amount of information. As a result, index weight of $c \in C$ can be found.

$$w_i = \frac{Sig_{C-\{c_i\}}(c)}{\sum_{j=1}^{n} Sig_{C-\{c_j\}}(c_j)} = \frac{I(C) - I(C - \{ci\})}{nI(C) - \sum_{j=1}^{n} I(C - \{c_j\})}$$

Analysis Network Process

Assuming determining matrix is *A*,

$$A = (a_{ij})_{m \times n}$$

Testing its consistency, and calculating random consistency ratio CR:

$$CR = \frac{CI}{RI}$$

If CR <0.1, then the expert judgments satisfied the conformance requirements matrix, or need to re-adjust after the test, until it meets CR <0.1 so far.